

REMARKS/ARGUMENTS

Reconsideration of this application is respectfully requested.

This case currently contains claims 6-24. All claims have been rejected.

Claims 1-5 in this case have been cancelled.

Claim 21 has been rejected under 35 USC 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner states it is not clear how the bracketing is intended to further limit the claim. No other rejection is applied to the claim.

This amendment cancels the bracketing formerly appearing in claim 21. As a result, claim 21 should now be allowable.

Claims 13, 14, 20, and 22-24 are rejected under 35 USC 103(a) as being unpatentable over Lambert, Jr. et al. in view of Sigg as set forth in the First Office Action.

This rejection is respectfully traversed.

The present invention is directed to the problem of reliably predicting the point in time just prior to when the grinding material is liable to be stripped from the hub (of the grinding wheel) and to allow the machine to be stopped before the wheel is irreparably damaged. See paragraph [0002], lines 10-12.

As described in the specification with reference to Figures 3 and 4, grinding forces are relatively constant over the life of the grinding wheel until just prior to wheel failure where the force is increased drastically. See paragraphs [0040] and [0041]. By

setting an appropriate threshold, imminent wheel failure can be predicted when the threshold is exceeded. Applicant has determined that measurement of the power demand made by the wheel feed drive motor is a convenient and accurate way to measure the normal force between the wheel and the workpiece for the purpose of measuring grinding forces. This is not taught by the prior art.

In the reference to Lambert, US 5,044,125, the grinding force is controlled within two predetermined limits. However, these limits are not related to the monitoring of wheel wear or the threshold used to anticipate wheel failure. Moreover, Lambert does not disclose the measurement of grinding force by using the power demand made by the wheel feed drive motor.

Lambert discloses an apparatus including a separate force transducer to measure the magnitude of the normal force factor occurring between the wheel and the workpiece as well as a control device for varying the feed rate and determining the relative wheel sharpness based upon the feed rate and the measured normal forces. The feed rate can be varied in the response to the determined wheel sharpness to maintain a substantially constant normal force and to optimize the grinding process. By monitoring the magnitude of the normal force factor and by determining the wheel sharpness the grinding machine of Lambert enables the following:

- 1) automatic conditioning of a superabrasive grinding wheel,
- 2) optimization of the grinding process, and
- 3) optimization of reshaping of the grinding wheel.

However, Lambert does not teach monitoring the normal force factor to predict imminent grinding wheel failure.

The Examiner relies on Lambert at column 16, lines 14-19. The text of Lambert states

"if the maximum normal force exceeds a safety limit, the feed is stopped, as there may be some problem with the machine. In actual use, the maximum normal force will never exceed this normal force unless there is a problem which must be addressed by the operator." (emphasis added)

This portion of the Lambert specification is directed to out-of-roundness detection, indicting the absence of any teaching in Lambert of solving the problem that is solved by applicant's invention as disclosed and claimed.

The normal wear of a grinding wheel and the subsequent need to replace the wheel is not a safety problem. The normal wear and subsequent need to replace a grinding wheel is not a condition which can be overcome by varying the feed rate of the wheel to maintain a substantially constant normal force as taught by Lambert. Thus, Lambert does not address the specific condition which the present invention addresses. Lambert does not disclose, teach or render obvious a method for reliably predicting grinding wheel failure so that the wheel can be withdrawn and renewed before it is irreparably damaged.

The Examiner states that Lambert teaches stopping the feed if the maximum normal force exceeds a safety limit, as there may be some problem with the machine. Applicant's method is not for determining if a safety limit has been exceeded, but is for determining when the natural life of a grinding wheel has come to an end and the wheel should be replaced.

The patent to Sigg, 4,637,169 is directed to an apparatus for controlling the advance of a machine tool toward a workpiece. Acoustic transducers are used to sense

the high speed approach, and then to reduce the speed of tool movement once the workpiece has been contacted. The system of Sigg relies on the acoustic signals which are emitted and detected by transducers 9 and 10, respectively. The transducer 10 also detects signals from the machine in addition to the signals from the transducer 9. The acoustic signals developed in the machine may be used to generate a warning signal to warn an operator to stop the machine for checking, or to affect an automatic stopping of the machine.

Sigg does not address the specific problem which applicant's invention solves. Sigg does not teach, show or render obvious the steps required to predict when a grinding wheel is prone to failure and to provide a warning signal for that event. There is no disclosure at all in Sigg that the immediacy of a grinding wheel failure creates a change in an acoustic signal which can be used to warn an operator or stop the machine. Sigg generally discloses that the change in an acoustic signal of a machine can be used to generate a warning signal but Sigg does not teach, disclose, or render obvious that the impending failure of a grinding wheel would cause such a change.

Thus, Sigg does not cure the deficiencies of Lambert in providing a proper prior art basis on which to reject applicant's claims. As a result, the rejection of claims 13, 14, 20, and 22-24 under 35 USC 103(a) as being unpatentable over Lambert in view of Sigg is improper, and should be withdrawn.

Claims 6-20 and 22-24 are rejected under 35 USC 102(b) as anticipated by, or in the alternative under 35 USC 103(a) as obvious over, Leitch et al. This rejection is respectfully traversed.

The patent to Leitch, 4,570,389 is directed to a grinding control system which

automatically determines the feed rate to maintain constant wheel sharpness. The Leitch grinding wheel either becomes dull or self-sharpenes during continued operation. Through use of the invention, wheel sharpness remains essentially constant.

Leitch is not at all concerned with predicting or anticipating grinding wheel failure.

Operating a wheel which is capable of maintaining its sharpness under certain operating conditions in such a way that the wheel maintains its sharpness is not at all the same as predicting the imminent failure of a wheel. There is no mention at all in Leitch that the failure of a wheel can be anticipated by sensing certain operating parameters of the wheel.

In order to sense the imminent failure of a grinding wheel, applicant's invention discloses measuring the power and thereby the torque developed by the wheel feed drive. The Leitch reference says nothing about measuring torque. The Leitch reference discloses nothing concerning anticipating the failure of a grinding wheel. The Examiner states that it would have at least been obvious in view of the teachings of Leitch to measure torque in the practice of the Leitch invention. However, measuring torque is taught only by applicant's invention, and not by Leitch. Accordingly, the rejection of claims 6-20 and 22-24 under 35 USC 102(b) as anticipated by, or in the alternative, under 35 USC 103(a) as obvious over, Leitch et al is improper, and should be withdrawn.

The Examiner states that Leitch teaches measuring normal force, steady state horsepower, or other process parameters to measure changes in wheel sharpness. Leitch does not teach that the force required for wheel in-feed can be used to determine when a grinding wheel is about to fail. Leitch does not teach that power drawn by the wheel in-

feed motor can be used to predict when a grinding wheel will fail. Although Leitch teaches a variety of methods to measure changes in wheel sharpness, Leitch does not teach or suggest that the torque developed by the wheel in-feed motor can be used to indicate when a grinding wheel is about to fail.

The Examiner states that applicant's claims do not recite that a separate force transducer is not required in order to measure grinding forces. This is not correct. Applicant's claim 20 specifically recites that the force between the wheel and the workpiece is obtained by measuring the power demand made by the (wheel feed drive) motor on its power supply. This is not at all shown in any of the references relied upon by the Examiner in the Office Action of June 2, 2006.

The Examiner states that independent claim 20 only requires measuring the force exerted by a wheel feed drive, referring to line 3 of claim 20. The Examiner further states that this is the force that is measured by the force sensor in Lambert. However, as stated above, claim 20 at lines 12 and 13 clearly states that an indication of the force between the wheel and the workpiece is obtained by measuring the power demand made by the motor on its power supply. For this reason, the Examiner's position on this point is clearly erroneous, and should be withdrawn.

Claims Previously Indicated as Containing Allowable Subject Matter

The Office Action dated December 19, 2005, indicated that claims 15-19 contained allowable subject matter and would be allowable if rewritten to overcome the rejection under 35USC112 set forth in the Office Action. It is believed the amendments made to the claims by the Amendment filed March 20, 2006 overcame that rejection, and further that the present rejection of claims 15-19 under 35 USC 102(b) as anticipated by

Amendment dated August 28, 2006

In Response to Office Action dated June 2, 2006

or in the alternative under 35 USC 103(a) as obvious over Leitch et al is improper, and should be withdrawn. Thus claims 15-19 should be allowable.

Conclusion

For the foregoing reasons it is believed that this Amendment places the claims now appearing in this case in condition for allowance, and an early notice to such effect is respectfully solicited.

In the event that the Examiner does not agree that the claims are now in condition for allowance, he is courteously invited to contact the undersigned at the number given below in order to discuss any changes which the Examiner believes would lead to an allowance of the claims.

It is believed that there will be no new fees necessitated by the entry of this amendment. In the event that any new fees or charges are required, authorization is hereby given to charge such fees to applicant's Deposit Account No 50-0852.

Respectfully submitted,

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